

Thesis  
Reports  
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# PINE-HARDWOOD MANAGEMENT GUIDELINES

NATIONAL FOREST IN MISSISSIPPI

GUIDELINES  
FOR  
PINE-HARDWOOD MANAGEMENT  
NATIONAL FORESTS IN MISSISSIPPI

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## I. Introduction

Many sites on Homochitto National Forest are highly productive for both pine and hardwood species. These sites are generally on very fertile, loess soils with a moist water regime. A forest type of pine-hardwood often develops on these sites, and very little difference in the growth performance between pine and hardwood species is apparent.

Mixed pine-hardwood will be featured in management on those soils where it is a recommended management type (See Table I) and where adequate, desirable hardwood rootstock is present at time of regeneration.

There are several reasons for featuring a pine-hardwood management type on selected sites, the primary one being the similarity in growth of the pine and hardwoods. This type will also provide for diversity of forest conditions and a more dependable mast supply for wildlife. In addition, because of the very fertile soils and the wide distribution of pine species, regeneration efforts on these sites almost always result in a mixed pine-hardwood stand. Finally, the very broken topography makes it very difficult to delineate pine and hardwood types separately in stands of manageable size.

It is recognized that management of the pine-hardwood type will not be easy, nor will any one management technique work in all cases. These guidelines are intended to provide general direction and to give District Personnel the necessary leeway to get the job done.

## II. Management Requirements and Objectives

The objective in managing the mixed Pine-Hardwood type is to produce large, high quality sawtimber of both pine and desirable hardwoods on an 80 year rotation. Some of the desirable hardwoods are Southern Red Oak, Cherrybark Oak, White Oak, Yellow Poplar, Green Ash, Sweetgum, Willow Oak, Black Cherry, and Hickory. Management will feature those species with both a commercial and a wildlife value. Although species composition may change throughout the life of the stand, silvicultural practices will be carried out with the objective of maintaining the mixed type throughout the rotation.

The mixed pine-hardwood management type includes both the pine-hardwood and the hardwood-pine types. Pine-hardwood is defined as stands in which 51-69% of the crowns in the dominant and co-dominant positions are pine. Hardwood-pine is defined as stands in which 51-69% of the crowns in the dominant and co-dominant positions are hardwoods. For our purposes, no differentiation will be made between the Pine-hardwood or hardwood-pine types. The guide is written for mixed pine-hardwood stands which contain 31-69% pine or hardwood composition.

Soil suitability will be the prime consideration in selecting sites for pine-hardwood management. Those soils suitable for pine-hardwood have been identified and are listed in Table I. However, other soils may be present in the stand, because of the broken topography.

Silvicultural practices will be a blend of hardwood and pine silviculture. Any practice which would be detrimental to one of the stand

components will have to be modified or eliminated. For example, prescribed burning can not be used after a stand has been regenerated, nor can root raking be used in site preparation. Since many of these sites are highly erodable, mechanical treatment will often be restricted.

### III. Inventory Prior to Treatment

Before any stand improvement, intermediate cutting, or reforestation work is done, an intensive survey of the stand must be made. This will normally be done as part of the compartment prescription. However, an additional survey may be required as soon as a harvest cut is completed to determine the amount of natural pine regeneration present. This survey will provide information on such things as stand density, species composition, overstory, midstory and understory conditions, and amount of advance reproduction present. This survey is especially important prior to regeneration. If adequate hardwood advance reproduction is not present, the stand will have to be deferred or regenerated to pine.

A minimum of 20 plots should be taken as a basis for the treatment decision. 1/100 acre plots will be used for seedling and sapling stem counts and 10BAF prism plots will be used in poletimber and saw-timber size material.

#### IV. Regeneration and Site Preparation

The regeneration process begins prior to harvest with the survey to determine if adequate, desirable hardwood is present to form the hardwood component of the new stand. The hardwood will come from several sources: (1) seedlings less than 2" in diameter at ground level, (often having a root system older than the above-ground stem), (2) saplings, greater than 2" DBH, (3) stump sprouts, mainly from stems up to 10" dbh, and (4) seed, mainly yellow poplar, already present in the duff.

Table #2 is a form developed by Robert Johnson, Principal Silviculturist, Southern Forest Experiment Station, Stoneville, Mississippi, used to inventory hardwood reproduction. The form utilizes a point system, by species, based on seedling height or DBH for stems 2" and larger. A total of 24 points per 1/100 acre plot is required for a pure hardwood stand. For pine-hardwood stands, half of this number, or 12 or more points per 1/100 acre plot is required. This regeneration should be evenly distributed over the stand. If possible, 40% or more of the advance reproduction should be oaks, with red oaks being favored over white oaks.

A major problem in regenerating pine-hardwood is the lack of advanced oak reproduction. In many stands qualifying for regeneration, the understory may contain little or no advance oak reproduction. If this is the case, the stand should be opened up with a shelterwood cut, 8 to 10 years prior to the removal cut, to encourage establishment of oak seedlings. A leave basal area of 45-60 square feet per acre is recommended for most stands. If the stand contains a heavy midstory

or understory of tolerant, undesirable species, these should be eliminated by chemical injection with 2, 4-D Amine. The shelterwood cut will also favor establishment of pine regeneration. It may be necessary to remove most of the pine from the overstory during the shelterwood cut in order to obtain the oak reproduction.

The pine component of the new stand can come from natural regeneration, using seed trees or seed fall from adjacent stands, or using artificial regeneration (planting or direct seeding). If seed trees are used, fewer will be needed for a pine-hardwood stand than for a pure pine stand. The actual number needed will vary depending upon terrain, amount of hardwood regeneration present, shape of the stand, and proximity to a seed source in adjacent stands. Seed trees should be left on hills where possible to facilitate seed desimination. If the pine is to be planted, the planting rate will vary depending upon the amount of advance hardwood and pine regeneration present. Generally, the number of pines planted per acre will range between 340 and 500. Because of the early growth advantage of hardwood sprouts, some pine seedlings will almost always be lost. Enough pine should be established to compose approximately half of the total basal area at the time of the first thinning.

Site preparation for pine-hardwood will usually be done by hand, since many of the sites occur on steep terrain or on highly erodable soils. However, if conditions permit, some form of mechanical site preparation, such as shearing, may be used. Root-raking should not be used.

It is important that the desirable hardwood stems greater than 1" diameter at ground level, remaining after logging, be severed. Sprouts

from these stems will form the hardwood component of the new stand. If excessive amounts of undesirable hardwoods such as dogwood and hornbeam are present, these should be injected with 2, 4-D Amine. Although these species will eventually be outgrown by the more desirable intolerants, they may shade out desired reproduction during the first few years. This will result in unstocked "islands" within the stand.

Prescribed burning may sometimes be used for pine-hardwood site preparation. Burning will top kill many of the smaller hardwoods resulting in new hardwood sprout growth. Before deciding to burn, the area should be surveyed to see if advance pine regeneration is present. Burning may destroy seed from species such as yellow poplar which is stored in the duff.

In some cases there may not be enough desirable hardwood to regenerate to pine-hardwood. Insufficient oaks in the overstory may also preclude a shelterwood cut. In these cases, the stand should be regenerated to pine but cultural treatments should be modified to allow for retaining what hardwood there is in the pine stand.

## V. Stand Improvement

After a stand is regenerated there may be a need for stand improvement work such as release, weeding, or precommercial thinning. Because of the high cost involved, this should be deferred until a commercial cut can be made, if at all possible. Since the hardwoods resprout vigorously, a thinning probably should not be attempted at all before age 10.

Before deciding on stand improvement work, a survey should be made of the stand to determine the number and spacing of free to grow stems as well as species composition. In a sapling stand, if at least 300 well spaced, free to grow stems of desirable species are present, a precommercial thinning probably is not necessary.

If a thinning is required, leave or crop trees should first be designated on the ground. If possible, approximately 50% of the crop trees should be pine and 50% desirable hardwoods. Thin only around selected crop trees, removing competing crowns that are  $\frac{1}{4}$  to  $\frac{1}{2}$  the crown width of the crop tree crown. Competing trees may be eliminated by using chain saw, injectors or hypo-hatchets using 2, 4-D Amine, or by other hand tools. Tordon 101 and 101R should not be used in stand improvement work or site preparation. If pine and hardwood are evenly distributed and the terrain permits, mechanical methods may be used.

## VI. Thinning Guidelines

The main reasons for thinning mixed pine-hardwood stands are to redistribute growth, salvage mortality, and control species composition.

The thinning method used will be either crown thinning or leave tree thinning. The leave basal area table shown in Table III will be used for pine-hardwood stands. (Table III) Generally a thinning is needed when the basal area of the stand exceeds that shown in Table III.

Thinning is the primary tool for maintaining a mixed pine-hardwood stand. Although generally the best tree will be favored in marking, regardless of species, this may have to be modified at times to maintain the desired species composition.

TABLE I

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SOIL SUITABILITY TABLE  
 RECOMMENDED MANAGEMENT TYPES  
 HOMOCHITTO NATIONAL FOREST  
 (BUDE AND HOMOCHITTO RANGER DISTRICTS)

<u>Soil EMU 1/ Code</u>	<u>Tentative Series Names</u>	<u>Recommended 2/ Management Types</u>
12200	Iuka	13, 58, 61, 64
13100	Gillsburg Falaya	62, 63, 64, 68, 69
13200	Collins Ariel	13, 58, 61, 62, 63, 64
23200	Bude - Moist	13, 31, 53, 58, 61, 64
23300	Bude - Dry	13, 31, 53, 58, 61
55206	Susquehanna	13, 31, 53, 58
61307	Saffell	31, 32
63300	Lexington Providence	31
63200		13, 31, 53, 58, 61
64300	Ruston Smithdale	31, 32
65306 3/	Susquehanna	21, 31, 32
71300	McLaurin Eustis	31, 32
71307	Saffell	31, 32
73300	Lexington	31
73200		13, 31, 53, 58, 61
74300	Smithdale	31, 32
74200		13, 31, 32, 53
74307	Saffell	31, 32
74380	Lucy	31, 32
75300	Cadeville Boswell	31, 32

<u>Soil EMU 1/ Code</u>	<u>Tentative Series Names</u>	<u>Recommended 2/ Management Types</u>
75306 3/	Susquehanna	21, 31, 32
83300	Lexington	31, 32
83307	Lexington-Gravelly Substratum	31, 32
83308 or 83208	Memphis	13, 31, 32, 53
83340	Providence	31, 32
83348	Loring	31, 32
84300	Ruston	21, 31, 32
85300	Cadeville Boswell	21, 31, 32
85306 3/	Susquehanna	21, 31, 32

#### 1/ Soil EMU Code:

Only those elements likely to be coded in the Soils Resource Inventory of the Homochitto National Forest are listed here. A more complete explanation of the Soil EMU coding system is available in the SOILS RESOURCE GUIDE - SOUTHERN REGION, pp. 20-23.

#### First Digit - Landform:

- 1 = Floodplain
- 2 = Stream Terrace
- 5 = Lower Slope (concave foot slopes)
- 6 = Sideslope (8-15% slope gradients)
- 7 = Steep Sideslope (15-60% slope gradients)
- 8 = Ridge (ridgetops with 2-8% slope gradients)

#### Second Digit - Soil Texture:

- 1 = Sandy (loamy sands, sandy loams)
- 2 = Loamy (loam, very fine sandy loam)
- 3 = Silty (silt loam, light silty clay loam)
- 4 = Medium (clay loam, sandy clay loam)
- 5 = Clay (clay, sandy clay, silty clay).

#### Third Digit - Water Regime:

- 1 = Wet
- 2 = Moist
- 3 = Dry

Fourth Digit - Accessory Characteristics:

0 = None  
4 = Fragipan  
8 = Sand Cap (20 - 40 inches thick)

Fifth Digit - Modifiers:

0 = None  
6 = High Shrink-Swell Clays  
7 = Gravel  
8 = Loess (40 inches or thicker)

2/ Following are recommended timber management types for the Homochitto National Forest. Associated species are not included.

13 = Loblolly Pine - Hardwood  
21 = Longleaf Pine  
31 = Loblolly Pine  
32 = Shortleaf Pine  
53 = White Oak-Red Oak-Hickory  
58 = Sweetgum...-Yellow Poplar  
61 = Swamp Chestnut Oak - Cherrybark Oak  
62 = Sweetgum - Nuttall Oak - Willow Oak  
63 = Sugarberry - American Elm - Green Ash  
64 = Laurel Oak - Willow Oak  
68 = Sweetbay - Swamp Tupelo - Red Maple  
69 = Beech - Magnolia

3/ Due to high shrink-swell clays occurring near the soil surface, soil moisture available for regeneration growth is very critical. Therefore, it is recommended to use shelterwood for longleaf pine and seedtree for shortleaf pine as a regeneration practice.

Date \_\_\_\_\_  
 Plot number \_\_\_\_\_  
 Location \_\_\_\_\_

## REPRODUCTION INVENTORY

Circular 1/100-acre plot (11.8' radius)

Points per tree and number of trees by species and size class

Species	Height (feet)			DBH (inches)				Tot. Pts.
	<1.0 Pts., No.	1.0-2.9 Pts., No.	3.0+ Pts., No.	2-5 Pts., No.	6-10 Pts., No.	11-15 Pts., No.	16-20 Pts., No.	
Ash	1	2	3	3	3	2	1	
Red oaks	1	2	3	3	2	1	0	
	1	2	3	3	2	1	0	
	1	2	3	3	2	1	0	
White oaks								
	1	2	3	3	2	1	0	
	1	2	3	3	2	1	0	
Hickory	1	2	3	3	3	2	1	
Sweetgum	1	2	3	3	3	2	1	
Blackgum	1	2	3	3	3	2	1	
Elm	1	2	3	3	2	1	0	
Yellow-poplar	1	2	3	3	2	1	0	
Maple	1	2	3	3	2	2	0	
Sugarberry	1	2	3	3	2	1	0	
Persimmon	1	2	3	3	2	1	0	
Other								
	1	2	3	3	2	1	0	
	1	2	3	3	2	1	0	

Stocked - 12 points or more

Yellow-poplar or sycamore seed tree  
within 100 feet

+6

Total points this plot \_\_\_\_\_

Seedbed bare

+2

Seedbed weedy

-2

TABLE III

LEAVE BASAL AREA  
FOR PINE-HARDWOOD STANDS

<u>Tree Height</u>	<u>Leave BA</u>
36 - 45'	50
46 - 55'	55
56 - 65'	60
66 - 75'	70
76 - 85'	75
86 - 95'	80
96 - 105'	90
106 - 115'	95